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FIELD CRICKETS IN MANITOBA

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The genus *Gryllus*, to which field crickets belong, is represented in Manitoba by two races, namely the Spring cricket, *Gryllus assimilis pennsylvanicus* Burm. and the Autumn cricket, *G. assimilis luctuosus* Serv. While these crickets are easily separated by habits their distinctive structural characters are very few and for that reason most authorities are inclined to classify them as mere varities of each other. I suspect, however, that this is an instance when similarity of structure must not be taken too literally particularly as there is no evidence of the insects' interbreeding, and especially as the great majority of adults of both appear at different periods of the year; the extremes alone overlapping.

The following key will assist to separate the two forms which I believe represent distinct species:

A.—Ovipositor short 9 to 12 mm., hind femora 11 mm, *pennsylvanicus*

B.—Ovipositor long 14 to 20 mm., hind femora 12 mm. ....*luctuosus*

In addition to the above characters *luctuosus* is larger, more noticeably so in life, and averages an extra spine on the outer edge of hind tarsi *i. e.* seven instead of six.

Key to species by habits.

A.—Adults present from May 1 to August 1. Oviposition period June and July. Young appear in August and winter as nymphs ..... *pennsylvanicus*

B..—Adults present from August 1 to winter. Oviposition period September and October. Young appear in June and develop into adults the same year ..... *luctuosus*

There is some variation in the above dates due to either an early or late spring. Thus it occasionally happens that adult *luctuosus* may be met with in July but in this case *pennsylvanicus* will have died off somewhat earlier and there will still be very little overlapping of adults.

As a guide to collectors it is safe to say that all adults taken before July 1 will be *pennsylvanicus* while specimens collected after August 1 are *luctuosus*.

Very little appears to be known about the immature stages, or habits, of field crickets and it was on this account that studies relating to them were undertaken in 1924. The results are subject to correction in so far as the number of instars are concerned as the insects have a habit of devouring their newly cast skins, and as they frequently moult at night it is difficult to check the various stages. It is believed, however, that the following account is substantially correct, the cage rearing having been checked by innumerable specimens from the field. With reference to the number of moults it should be borne in mind that there is probably some variation in individuals just as there is in grasshoppers which may have five or six moults.

Gryllus pennsylvanicus Burm.

Egg elongate cylindrical, very shiny, bright, cream yellow; length 3 mm., width .80 mm.

First instar. Antennae approximately 36 segments; head large; pronotum slightly concave on posterior edge; mesonotum about two thirds visible at first, later wholly so; metanotum superficially appearing to form part of the abdomen; hind tarsi with the spines bristle-like; cerci tapering to a fine point about as long as the abdomen. General color brownish-black, sides of pronotum, mesonotum, underside of thorax and tarsi pale yellowish; abdomen dull pinkish beneath; cerci orange.

Second instar. Antennae 50 to 62 segments, general appearance much as before; hind tarsi with 4 to 5 spines on outer edge. General color blackish, mesonotum pale yellow darker dorsally, sides of pronotum margined with yellow, tarsi as before.

Third instar. Antennae 90 segments; mesonotum but half visible pale as before; wing lobes indistinctly showing at ventral edges of the meso and metanotum; hind tarsi with six spines on inner and outer margins. Color above dull black, pale below; cerci dull brownish.

Fourth instar. Antennae 118 segments; wing pads more plainly visible on meso and metanotum as downward elongations of those segments, the wing area being very shiny. Spines on hind tarsi as before; ovipositor plainly visible beneath, not attaining the tip of abdomen.

Fifth instar. Antennae 120 segments; mesonotum rather narrowly visible; tegmina and wing pads of almost equal length, horizontal or upturned, the base of the former overlapping the lower edge of the latter, both narrow; ovipositor tip in view from above.

Sixth instar. Antennae 160 segments; wing pads and tegmina wider than before, the latter twice as long as the former; ovipositor longer, valves and part of stem noticeable from above.

Gryllus luctuosus Serv.

There are very few constant characters, if any, to separate the immature stages of this species from those of *pennsylvanicus* and nothing is gained, therefore, by going into details.

Egg. Highly polished and quite transparent to begin with; color yellowish or bright creamy; length 3 mm., width .80 mm.

First instar. Antennae about 36 segments; general structure as in *pennsylvanicus*; color blackish, the pronotum and mesonotum bright yellowish, the former partly black in some specimens; underside, including tibiae, pale; cerci orange.

Second instar. Antennae 56 segments; tibiae with 3 or 4 spines on outer edge; color as before.

Third instar. Antennae 80 to 90 segments; wing pads on meso and metanotum indicated by a downward prolongation of the lateral lobes of those segments; hind tibiae with 6 spines on outer edge; color much as before.

Fourth instar. Antennae 108-111 segments; wing-pads strongly indicated; ovipositor extending beyond abdomen; hind tibiae with 7 spines on outer edge; color above black, cerci dark.

Fifth instar. Antennae 114-120 segments; wing-pads up-turned horizontal, leathery in appearance; ovipositor about as long as the last threee abdominal segments.

Sixth instar. Antennae 140-146 segments (female), 146-166 (male); wing-pads longer and wider than before, hidden at base by pronotum, tegmina free, extending across the second abdominal segment; ovipositor equalling or slightly exceeding the cerci.

There is a good deal of variation in the different parts. The antennae are frequently broken off at the tips or the sutures are indistinctly marked, there is also a difference in the number of segments in males and females at least in the later stages, the former having more. The wing-pads and tegmina in the fifth instar may equal each other or the former be much shorter, while in the sixth instar the wings may be separated or meet over the back and the ovipositor may exceed the cerci or not quite attain their tips. It must be understood, therefore, that the above description represents average individuals and that in the antennae, especially, the number of segments are approximate rather than exact.

The range of these two crickets is very similar and it is quite a common event to find both beneath the same object. In summer the nymphs of *luctuosus* may occur with the adults of *pennsylvanicus* and in autumn juveniles of the latter keep company with adults of the former, but *pennsylvanicus* is not as sociable as its fall relation nor is it, apparently, as evenly distributed.

The preferred home of *pennsylvanicus* is amid grass clumps or among the leaves on a sunny side of a sand ridge. In such places its music may be heard almost incessantly in spring time but so effectually are the musicians hidden that it requires the utmost care to locate them. They have been known to reach maturity in early May even before the oaks are in leaf and a few old individuals overlap the newly developed *luctuosus* in August but as a rule the activities of adult *pennsylvanicus* are over before those of *luctuosus* begin. The species winters as a nymph generally in the last two instars, hibernating beneath any convenient object.

Luctuosus is more gregarious in habits than *pennsylvanicus* and it associates in all its stages of growth. On lands still uncultivated this species takes advantage of any covering to hide beneath and failing these digs short burrows in the soil as shelter. In cultivated areas it has made itself at home on, or beneath, the many objects provided by man, hay cocks and grain stooks being particularly favored.

This cricket is essentially an autumn insect and its activities are at their greatest during harvest time. Tree crickets and some other Orthoptera may have louder notes but *luctuosus* drowns them all by the sheer number of its musicians. There is no appreciable difference in the music of this species and that of *pennsylvanicus* but there may be great variation in the notes of either due to temperature or to the different stages of courtship. When the temperature is high the music is quick and shrill but on a cool night one only hears a few slow notes as if the player had become drowsy or benumbed with the cold.

The Autumn cricket continues active well into October even after hard frosts and a good deal of egg-laying is done early in the month, but as winter approaches these insects become less numerous until eventually cold and old age

bring their various activities to an end.

As the general habits of these two crickets are much alike they will be treated together in the following paragraphs.

Courtship and ultimate mating is very similar to that of the tree crickets (*Oecanthus*). The female is attracted to the male by his music which appears so fascinating to her that she follows him eagerly and will travel a considerable distance towards his notes. As she draws near the music becomes less loud but more exciting in tone and spasmodic in execution. Ultimately she either mounts upon his back or he backs under her. Pairs of both species mated frequently in my cages and there is no question but that one male often fertilises more than one female.

Egg development within the ovaries appears to be similar to other *Orthoptera* but the eggs instead of being placed in clusters like grasshopper eggs are deposited singly.

When ready for oviposition the female wanders forth in search of a suitable situation in which to place her eggs, this usually being some bare sandy place, or in the open spots of a stubble field. Having become satisfied, the insect usually digs a shallow excavation with her front and middle legs and then moving slightly ahead, thrusts her ovipositor into the soil to its base pulling back with the hind legs while thus occupied. If the place is suitable she deposits an egg otherwise she tests other places within the excavation or moves elsewhere. There is generally some difficulty in withdrawing the ovipositor especially in *luctuosus* due, apparently, to its length which is greater than the insect can stretch its abdomen upwards. This may in part explain the excavation and also why the cricket chooses an elevation to stand upon when that is possible. The drilling takes less than 20 seconds and the whole process of depositing an egg about 7 minutes. Yet a female in my cages took more than 9 hours to deposit her quota of eggs. Whether the insects deposit more than one clutch of eggs or not I am unable to state but four females in one cage deposited an aggregate of 542 eggs, the last female completing her task in November.

In their first stages these crickets are much more apt to walk than hop though they can jump readily enough when frightened and take cover with astonishing rapidity. They make their homes amid any convenient rubbish and when about to moult hang up head downwards much as grasshoppers do but the process usually takes place close to the ground and the skin casting can be accomplished beneath boards within an extraordinary small compass.

Both species are nocturnal to some extent but while they prefer to hide from the sun's rays during hot days they have no hesitation in taking advantage of its warmth when the weather is cool. *Luctuosus* is particularly noteworthy for its gatherings in the sun and I have seen instances when the south sides of grain stooks were black with these crickets warming themselves.

The breeding season for *pennsylvanicus* is in the height of summer and this species has, therefore, little need for extra warmth but *luctuosus* has colder days to contend with and it is consequently a common sight to see the females wandering about during the day time, sometimes seeking the males, at others busily engaged in egg-laying.

The male of both species fight energetically using both legs and jaws but

the combats are of short duration and quickly end in the retreat of one combatant with the other in pursuit.

The music is attractive to both sexes but for different reasons. To the females it means courtship but to the males it indicates a rival to be fought and, if possible, overcome. The music of the cricket is thus very similar in purpose to that of birds.

The females are more docile than their musical mates and they seldom molest each other. The males, too, recognise and respect the females though their zealous and perpetual courting is not always appreciated by their lady-loves.

Crickets are somewhat omnivorous in their food habits though not entirely so. They do not like grass but will eat sparingly of broad leaved plants such as plantain, wild buckwheat and cabbage; they like green peas and soft corn grains. Immature flax is particularly relished on occasions and serious harm has been caused to it through their attack. Animal matter is partaken of with relish and I reared my first instar nymphs on tabanid flies alone but later discovered that moistened bran might be safely substituted for the insect diet. Cannabalism, rather prominently referred to in literature, was not indulged in to any marked extent in my cages, even though these merely consisted of fruit jars. Dead individuals were eaten readily but I had surprisingly few casualties considering the restricted space in which the insects were living and the nymphs showed no real inclination even to fight.

Perhaps one of the most interesting food habits of *luctuosus* is that of digging up and eating grasshopper eggs; only a few are eaten as a rule but the others remain exposed and usually perish. An obnoxious habit in which crickets indulge is that of eating binder twine and clothes. There have been times when thousands of grain sheaves have had their bands cut by these insects thus adding considerably to the farmers' labors as well as to the cost of operation. Coats carelessly thrown down may be ruined in a very short time as many people have learnt from experience. Grasshoppers, however, are willing aids in both band cutting and coat eating and the results are so much alike that no one can tell the difference. With leaves, however, crickets almost invariably eat holes in them rather than attack them from the edges as grasshoppers do. The insects have strange tastes at times. Moisture seems to be nearly always relished and this fact may account for the crickets eating dead leaves when they are moist but refusing them dry. I believe it also indicates why they are more destructive to flax, etc. when the soil is dry than when it is wet, the seeds in the former case providing the necessary moisture.

The economic importance of field crickets has already been indicated in discussing the food habits above. As a rule the insects' chief claim to notoriety lies in the cutting of binder twine on the sheaves and the more casual injury to clothing left lying about. In 1923, however, they became a more serious menace when they attacked late flax to a marked extent and in some cases did very great damage to it. We have previously known soft grain to be eaten in a small way and odd cabbage plants have been killed by the insects in the spring but as a rule crickets are not very destructive to crops of any kind though it is conceivable that when they become as numerous as they were in 1923 many abnormal food habits might develop in order to make up for a deficiency in the ordinary

articles of diet.

The only valuable traits to which crickets can be credited is their habit of digging up and devouring grasshopper eggs. We observed a few instances in 1922 when this habit had been indulged in to quite a marked extent and odd beds of *Camnula* eggs had been partly dug up in 1921.

Most of the injury caused by crickets can be referred to *luctuosus*, the depredations of *pennsylvanicus* being confined to the destruction of a few seedlings in spring time.

The natural enemies of crickets are doubtless numerous though we have found surprisingly few of these. Hairworms (*Gordius* sp.) are the only parasites we have reared in our cages.

Of the larger enemies of crickets crows undoubtedly play a leading part because they not only turn over chips and cattle dung in search of insects but they also pick them off the hay cocks and grain stooks. Skunks, badgers and various small birds are all of value as destroyers of crickets but we suspect that it is to parasites we owe most in keeping them within bounds.

The control of crickets may be attained by the use of a poisoned bait consisting of bran 20 pounds, arsenic one pound and enough water to moisten thoroughly. Fruit and molasses are not necessary and amyl acetate appears to be a deterrant. It is possible that a little salt added to the bait would increase its attractiveness. This mixture should be scattered over the infested fields in the evening of warm days in order that it may be wet when the crickets come out to feed. Dry bait is practically useless.

Binder twine and other objects subject to injury by cricket and grasshoppers can be protected by smoking them under cover for not less than 48 hours. In our experiments we used ordinary poplar sawdust for making the smoke and judging from the immunity of treated rags in comparison to untreated ones there was every reason to be satisfied with the results.

NOTES ON THE DIPTEROUS FAMILY THEREVIDAE.

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Since the publication of the writer's Revision of the North American Therevidae several corrections have been suggested and examination of additional material has furnished new distributional records. The writer is indebted to C. H. Curran and to Professor J. S. Hine for the loan of valuable material.

Professor T. D. A. Cockerell called my attention to the fact that he had described a Therevid from Burmese amber in 1920; this species, *Psilocephala electrella*, was described on page 170 of the Entomologist, and the type is in the British Museum. Cockerell points out the fact that Krober, in describing *Psilocephala platyptera*, located Rockstone Essequebo in Guatemala; he undoubtedly refers to the place of this name in British Guiana; therefore the species should not be included in North American lists. I am also indebted to Prof. Cockerell for correcting a locality record given on page 118 of my paper; *Thereva neomexicana* was taken at Arroyo Pecos (probably by Cockerell), and Arroyo Pecos has nothing to do with Pecos River; it is at Las Vegas.

At the bottom of each plate of figures in the writer's Revision of the

Therevidae the name of the family is misprinted Therividae.

I am indebted to E. Bergroth, Ekenas, Finland, for calling my attention to a necessary change of name. In a paper on certain palaearctic Therevidae published in the journal Notulae Entomologicae, vol. I, pp. 81-85 (1921), R. Frey has founded the new genus *Aristothereva* on those species of *Psilocephala* Zett. in which the eyes of the males are separated by a space about equal to the width of the ocellar tubercle. The type of the genus is the new species *Aristothereva latifrons* from Turkestan. Bergroth agrees with Krober and the present writer that this sexual character is not sufficient to found a genus upon. The North American species *Psilocephala latifrons* Cole is congeneric with *latifrons* Frey and the species name given by Frey has priority. I propose the new name *amplifrons* for the North American form, *P. latifrons*.

The following new locality records may be added to those previously given by the writer:

Epomyia rufiventris (Loew). Specimens from Strathroy, Ontario, June 28 (H. F. Hudson) and July 27 (H. G. Crawford); Onah, Manitoba, June 21 (N. Criddle).

Epomyia bella Cole. Oilley, Texas, May 4, 1920 (H. J. Reinhard).

Epomyia pictipennis (Wied.) Wayne Co., Mich., Aug. 31 (Andrews); Southern Pines, N. C., May 3 (Manee); Vinton, Ohio, June 20 (J. S. Hine); Cameron, La., June 30 (Hine).

Psilocephala frontalis Cole. Devil's Lake, N. D., July 25 (Hubbell).

Psilocephala platancala Lw. Six specimens from Aweme, Manitoba, probably belong here, but the wings are almost pure hyaline; these specimens were taken in June by E. Criddle, R. M. White, and P. N. Vroom.

Psilocephala aldrichi Coq. Bottineau, N. D., August 1 (Hubbell); Aspen Grove, B. C., July 14 (Vroom); Saanich, B. C., July 3 (W. Downes); Chilcotin, B. C., July 26 (Buckell); Wellington, Alberta, August 3 (Strickland); Lethbridge, Alberta, July 14, 1921 (H. L. Seamans).

Psilocephala munda Lw. Onah, Manitoba, June 21 (N. Criddle); Alexander, Man., June 23 (Criddle); Aweme, Man., July 31 (Robertson); Melita, Man., Aug. 11 (N. Criddle).

Psilocephala limata Coq. Wellington, B. C., July 27; Lake Cushman, Wash., July 29 (F. M. Gaige).

Psilocephala variegata Lw. Black River, Macinac Co., Mich., June 4 (S. Moore).

Metaphragma planiceps Lw. Nicola, B. C., April 30 (P. N. Vroom).

Thereva vialis O. S. Victoria, B. C., June 23 (Downes); Onah, Man., May 25 (H. A. Robertson).

Thereva candidata Lw. Wakefield, Quebec, August 6 (J. McDunnough); Coldstream, Ont., June 15 (A. A. Wood); Hog Island, Charlevoix Co., Mich., July 26 (S. Moore); District of Columbia, August 11 (J. S. Hine); Floodwood, Schoolcraft Co., Mich., July 23 (J. S. Rogers).

Thereva cinerascens Cole. Nicolum R., Hope, B. C., July 13 (Harvey).

Thereva cockerelli Cole. Delta, Man., July 2 (H. A. Robertson); Fish Lake, Sask., June 17 (N. Criddle); Onah, Man., June 21 (P. Vroom); Huron Mts., Marquette Co., Mich., July 10, 1919 (Andrews); Whitefish Point,

Chippewa Co., Mich., Aug. 1, 1914 (F. Combs).

Thereva johnsoni Coq. Lake Cushman, Mason Co., Wash., July 29 (Gaige).

Thereva brunnea Cole. Vancouver, B. C., May 25, 1903.

Thereva ustulata Krober. Ottawa, June 27, 1914.

Thereva frontalis Say. Detroit, Mich., June 9, 1906; Dickinson Co., Mich., Marquette Co., Mich., July 10, 1919 (A. W. Andrews); Floodwood, Mich., July 20 and August 3.

Thereva flavicincta Lw. Wanakena, N. Y., Aug. 1 (C. J. Drake); Gagebic Co., Mich., July 27 (Hubbell); Whitefish Point, Chippewa Co., Mich., July 28 (A. W. Andrews).

Thereva cingulata Krober. Deer Park, Colo., July 23, 1898.

Thereva strigipes Lw. (?) Banff, Alberta, 1916 (N. B. Sanson).

Thereva duplicis Coq. This species is not uncommon in parts of eastern Canada; the following localities can be added to those already given:—Souris, Whitewater, Rapid City, in Manitoba, collected from June 29 to August 22.

Psilocephala albertensis new species.

Male. Length 7 mm. Nearly related to *P. frontalis* Cole. Frontal triangle shining black, with a few whitish pile on sides which are about the length of first antennal joint. Ocellar tubercle black, gray pollinose. First two antennal joints black, gray pollinose; quite long black bristles and pile on the first joint; third joint missing. Face silvery white pollinose. Palpi black, white pilose. Occiput and cheeks black, white pollinose; cheeks with a dark spot but no black pile.

Thorax black; most of the mesonotum grayish brown pollinose, with two widely separated white vittae; sides of mesonotum gray pollinose. Pile of mesonotum sparse, erect, and white. Pleura gray pollinose, with white pile, very long and dense on the mesopleura. Halteres blackish brown. Scutellum black, thinly gray pollinose, with few white pile, and four marginal bristles.

Abdomen black, dense gray pollinose, except for spots on antero-lateral corners of third, fourth, and fifth tergites; dorsum more or less flattened and silvery, with short, sparse, reclinate white pile, longer on the sides. Genitalia rather small, brown, white pilose, a few black bristles on the hypandrium. Femora black, tibiae yellow with black tips; bases of metatarsi yellow, the rest of tarsi black. Wings whitish hyaline, stigma brown; cell M_3 closed and petiolate, small cross-vein slightly clouded.

Female. Length 8.5 mm. Much like the male. Bristles of first antennal joint much shorter than in male; third joint broader than first at base, tapering, and about length of first (see fig.). Frons broad, sides gray pollinose, the larger part rounded and shining, silvery pollinose on lower corners.

Pile on pleura much shorter than in male. Pile on mesonotum short and mostly brown. Base of the scutellum brown.

Abdomen almost all shining black, the first segment thinly grayish; white pollinose posterior margin on second segment; pile on first two segments white, beyond this short, erect, and black. Circlet of spines at tip of abdomen blackish brown. Legs as in male (anterior legs missing in type), the tibiae more brownish in color. Wings largely brownish hyaline, the centers of cells much lighter.

Holotype, male, collected by W. Carter, June 15, 1921, and allotype, female,

collected by H. L. Seamans, May 31, 1921; No. 448 in Canadian National Collection.

Type locality. Lethbridge, Alberta, Canada.

The male runs to *frontalis* in the writer's table of species, but has no black bristles on the genitalia, the entire frontal triangle is black; there is no median, black stripe on mesonotum, etc. The female is distinguished by the two distinct whitish vittae on the mesonotum, the brownish wings, and the shining black abdomen.

Thereva macdunnoughi new species.

Male. Length 8 mm. Antennae black, gray pollinose, the first joint about the length of the third and with long black pile and bristles (see fig.) Frons and face gray pollinose; frons and outer rim of face with long, erect, black pile; central portion of face and the palpi white pilose. Occiput gray pollinose, the upper part with fine bristles, the lower portion white pilose.

Thorax and scutellum black, gray pollinose; mesonotum and scutellum with rather long, erect, black pile. Scutellum with four black marginal bristles. Mesonotum with faintly marked darker vittae. Pleura gray pollinose, white pilose. Stem of halteres yellowish, the knob black.

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P. albertensis *T. macdunnoughi*

Abdomen black, yellowish white pilose, the anterior portion of second to sixth segments semishining, the posterior portion gray; first segment gray pollinose, second, third, and fourth segments with yellow incisures. Genitalia with yellowish pile and bristles, a few black bristles on the hypandrium on either side of the cerci; hypandrium with a short reddish knob-like projection on each side. Legs wholly black; femora with black pile, longer on the two front pair, some white pile at base of hind pair. Wings gray hyaline; cell M_3 closed and petiolate, the small cross-vein and front part of cell 1st M_2 faintly clouded; stigma brown.

Female. Length 10 mm. Differs considerably from the male. Frons broad, yellowish pollinose; the heart-shaped, semishining callosity on the frons reaching to the ocellar tubercle. Upper occiput yellowish, with a row of black bristles on sides.

Mesonotum gray pollinose, with a wide median vitta which narrows posteriorly and an elongate, semishining, black spot on either side. Mesonotum with considerable yellow pile mixed with the black. Scutellum yellow pilose.

Abdomen largely shining black, the gray pollinose area of second and following tergites confined to narrow posterior portion. Venter thinly gray pollinose on first three segments, black beyond; First three segments yellow pilose, the others with coarse, erect black pile. Circlet of bristles at tip of abdomen reddish.

Femora with more white pile than black, very short and reclinate on the hind pair. Wings as in male.

Holotype, male, and *allotype*, female, collected by J. McDunnough, July 18, 1921; No. 447 in Canadian National Collection.

Type locality—Nordegg, Alberta, Canada.

The female runs to *brunnea* Cole in the table given in the Revision of the Therevidae. The thoracic markings are much darker than in *frontalis* and there is no brown spot on the scutellum; the legs are darker than in *frontalis* and *brunnea*, and the cordate mark on the frons of the female is larger than the similar mark in *brunnea*. The abdomen of the type female was injured by dermestids subsequent to description.

Thereva bimaculata Cole.

Male. Length 9.5 mm. Differs in a few particulars from the female, which was described in the writer's Revision of the Therevidae.

The eyes (in the one specimen examined) separated by the width of the ocellar tubercle; on each side of the frons there is a large semicircular velvet black spot; these spots nearly touch on the median line. The lower frons silvery white pollinose and white pilose, with a few black pile.

Thorax greased in the specimen examined, apparently gray pollinose, the median portion of the mesonotum more brownish; pile and tomentum-like hairs silvery white, a few darker pile.

Abdomen of male quite slender and comparatively long, the dorsum with reclinate silvery white pile, remarkably dense and rather long on the apical half, concealing the rather small genitalia. Abdomen gray pollinose, the incisures yellow. Venter with some black pile intermixed with the white. Genitalia shaped much as in *vialis* O. S.

Neallotype, a male, in the collection of J. S. Hine, taken by A. H. Manee, April 10, 1912.

Type locality, Southern Pines, North Carolina.

The type female was taken in the same locality as the above specimen, April 4, 1906, and two paratype females, April 11, 1906. The unusual frontal marking will distinguish the male of this species; and if the eyes are normally separated as in the one specimen seen the species is quite unique in the genus *Thereva* in this country. Krober erects the genus *Neothereva* for *Thereva*-like forms in which the eyes are separated by a space equal to the width of the ocellar tubercle; unless other distinctive characters are present this seems to be a very weak character with which to set off a genus.

PROMOTIONS IN DOMINION ENTOMOLOGICAL SERVICE.

The Dominion Entomologist announces three important promotions which have recently been made in the Entomological Branch, Department of Agriculture, Ottawa, namely, Mr. H. G. Crawford from Entomologist to Chief of the Division of Field Crop Insects, with headquarters at Ottawa; Mr. E. R. Buckell from Assistant Entomologist, Ottawa, to Entomologist in charge of the Entomological Laboratory, Vernon, B. C., and Mr. W. N. Keenan, Division of Foreign Pests Suppression, from Assistant Entomologist to Entomologist, with headquarters at Ottawa.

DESCRIPTIONS OF A NEW GENUS AND ELEVEN NEW SPECIES OF NORTH AMERICAN MIRIDAE (HEMIPTERA).*

BY HARRY H. KNIGHT,
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Psallus tinctipennis new species.

Distinguished by the long rostrum, testaceous color with black calli, roseate red on cuneus and more or less on basal half of corium.

♂. Length 3 mm., width 1.06 mm. Head: width .63 mm., vertex .31 mm. Rostrum, length 1.31 mm., reaching upon sixth ventral segment, pale to fulvous, apex blackish. Antennae: segment I, length .18 mm., black, apex pale; II, .93 mm., pale to dusky; III, .88 mm., fuscous; IV, .36 mm., fuscous. Pronotum: length .48 mm., width at base .91 mm. Yellowish testaceous, tylus, frons, eyes, and calli, black, the black color on frons sometimes taking the form of oblique bars; mesoscutum and a cloud on apical area of corium fuscous; cuneus roseate red, outer margin and apex, pale; corium pale roseate except on fuscous apical area, embolium pale; basal half of pronotum and clavus faintly tinged with roseate, apical area of clavus clouded with pale fuscous. Membrane and veins pale, infuscated on apical half beyond cuneus, on anal area, and within smaller areole, although with a pale area each side at middle of apical half. Dorsum thickly clothed with prostrate, silvery, sericeous pubescence, a few such hairs turning to golden brown on clavus, cuneus, and apical area of corium. Pale beneath, sternum fuscous, also a subdorsal lateral line on venter becoming fuscous; genital segment pale fuscous. Legs pale, hind femora with two rows of fuscous spots on anterior face, each spot composed of minute dots, also with three or four small spots apically on posterior aspect; tibiae pale, spines black but without spots at base; tarsi fuscous, paler on basal half.

♀. Length 3.2 mm., width 1.3 mm.; very similar to the male in coloration and pubescence.

Holotype: ♂, August 5, 1924, Santa Catalina Mts., alt. 3000 ft., Arizona (A. A. Nichol); author's collection.

Allotype: same data as the type.

Paratypes: ♂, taken with types. ♂ 3 ♀ August 29, 1924, Santa Rita Mts., alt. 4500 ft., Arizona (A. A. Nichol).

Psallus maculosus new species.

Allied to *aspersus* V. D., but differs in the unspotted membrane, and in the more uniformly dotted dorsal surface including the head.

♂. Length 3.3 mm., width 1.3 mm. Head: width .74 mm., vertex .23 mm.; fulvous, with pale fuscous dots at base of hairs. Rostrum, length 1.12 mm., attaining posterior margins of hind coxae. Antennae: segment I, length .20 mm.; II, 1.03 mm., nearly equal in thickness to segment I; III, shriveled; pale yellowish, pale pubescent, two or three hairs on segment I with obscure pale fuscous at base of each. Pronotum: length .48 mm., width at base 1.08 mm. Pale whitish translucent, head yellowish to fulvous, pronotum and scutellum tinged with dull yellowish: dorsal surface, including head, embolium and cuneus, rather uniformly and finely dotted with pale fuscous, a dot tending to form about the base of

*—Contribution from the Department of Zoology and Entomology, Iowa State College, Ames, Iowa.

each pubescent hair. Membrane and veins pale, within apex of areoles, and a barely visible arc-shaped cloud beyond areoles, pale fumate. Clothed with pale to yellowish pubescence, without evident sericeous pubescence, a character which indicates this species may not remain in Psallus. Legs pale with a tinge of yellowish, femora with small, chiefly transverse fuscous spots; tibial spines brown to black, each with a blackish spot at base, also with spot on knee; tarsi fuscous on apical segment.

Holotype: ♀, March 29, 1924, Tucson, Arizona (A. A. Nichol); author's collection.

Paratype: ♀, taken with the type.

Reuteroscopus longirostris new species.

Closely related to *ornatus* Reut., but form more slender, head a trifle longer, while the rostrum is distinctly longer, reaching to middle of venter; color greenish yellow, with less fuscous coloration than *ornatus*.

♂. Length 3.2 mm., width 1.2 mm. Head: width .64 mm., vertex .35 mm. Rostrum, length 1.37 mm., reaching upon seventh ventral segment, yellowish, first segment green, apex of last segment black. Antennae: segment I, length .18 mm.; II, 1.08 mm.; III, .77 mm.; IV, .41 mm.; pale, last two segments pale fuscous. Pronotum: length .48 mm., width at base .68 mm. Head and pronotum green to yellowish, vertex and calli distinctly yellow; scutellum fuscous, apex pale; hemelytra pale greenish yellow, subtranslucent, clavus except outer margin, and inner apical angles of corium fuscous, anal ridge pale. Membrane pale fuscous, larger areole paler, smaller areole dark fuscous, paler bordering apex of cuneus, a rather large pale spot along margin at middle of apical half, similar to that in *ornatus* but larger. Dorsum clothed with prostrate, pale sericeous pubescence, but with small spots and areas nearly glabrous, the whole intermixed with more erect pale fuscous pubescent hairs, being much softer and finer than in *ornatus*, head and anterior half of pronotum with pale pubescence only. Ventral surface green to yellowish, sternum more yellow, venter clothed with pale pubescence. Legs pale, coxae greenish yellow, femora with a few small, pale fuscous points on apical half of anterior face, pubescence dusky; tibial spines black but without spots at base; tarsi dusky, fuscous apically.

♀. Length 3.1 mm., width 1.14 mm.; very similar to the male except membrane paler, smaller areole and a distinct longitudinal mark behind apex of areoles, darker fuscous.

Holotype: ♂, July 21, 1917, Santa Cruz river, Tucson, Arizona (H. H. Knight); author's collection.

Allotype: taken with the type at light.

Paratypes: 2 ♂, taken with types.

Orthotylus minuendus new species.

Distinguished by the small size, short rostrum, large eyes, and blue green color.

♂. Length 2.6 mm., width .94 mm. Head: width .67 mm., vertex .16 mm.; width of head nearly equal to seven-eights of the width of pronotum at base; eyes large, black. Rostrum, length .67 mm., scarcely attaining posterior margin of mesosternum. Antennae: segment I, length .18 mm.; II, .77 mm.;

III, .68 mm.; IV, .25 mm.; uniformly pale yellowish. Pronotum: length .40 mm., width at base .80 mm. Dorsum blue green; membrane uniformly fumate, veins blue green; clothed with very minute, prostrate, pale pubescence, and interspersed with longer, more erect, pale soft pubescent hairs. Body beneath pale green, sternum paler. Legs pale yellowish to green, tibiae and spines pale. Genital claspers small but distinctive, left clasper a simple, curved, acuminate hook, right clasper little different although slightly shorter.

♀. Length 2.6 mm., width .95 mm. Head: width .59 mm., vertex .27 mm. Pronotum: length .36 mm., width at base .80 mm. Very similar to the male in form and color, although vertex and mesoscutum yellowish.

Holotype: ♂, August 5, 1924, Santa Catalina Mts., alt. 3000 ft., Arizona (A. A. Nichol); author's collection.

Allotype: same data as the type.

Paratypes: ♀, taken with type. ♀ July 15, 1917, Bowie, Arizona; ♂ July 16, 1917, Bonita, Arizona; ♂ July 20, 1917, Texas Pass, Arizona (H. H. Knight), collected at light.

Orthotylus mistus new species.

Shape of head and general color very similar to *coagulatus* Uhler, but size fully one-third larger; belongs in the *flavosparsus* group.

♀. Length 5 mm., width 2 mm. Head: width .97 mm., vertex .59 mm. Rostrum, length 1.23 mm., reaching to middle of intermediate coxae. Antennae: segment I, length .40 mm.; II, 1.48 mm.; III, missing; clothed with rather coarse black pubescence. Pronotum: length .74 mm., width at base 1.48 mm. Yellowish green, the hemelytra more blue green; antennae and legs greenish yellow. Dorsum clothed with prostrate, silvery sericeous pubescence and intermixed with erect black hairs, being very similar to *coagulatus* Uhler in this respect. Membrane uniformly pale fuscous, veins green. Venter with simple pale pubescence.

Holotype: ♀ July 31, 1921, Nordegg, Alberta (J. McDunnough); No. 1350 in the Canadian National collection.

Paratype: ♀ July 10, 1921, Nordegg, Alberta (J. McDunnough); author's collection.

This species runs to *ovatus* V.D. in Van Duzee's key (Proc. Calif. Acad. Sci. (ser. 4) vi, 1916, p. 89) to the species of *Orthotylus,* but is clearly distinguished therefrom by the shorter rostrum and smaller eyes; the dorsal width of an eye is barely equal to one-third the width of vertex, while in *ovatus* the eye is equal to one-half the width of vertex. In *mistus* the length of antennal segment I is only equal to two-thirds the width of vertex.

Ilnacorella new genus

Arolia erect and converging at apices as in Ilnacora; closely related to Ilnacora but differs in being more elongate and in lacking the black scale-like pubescent spots on pronotum; the dorsum clothed with rather evenly distributed, appressed, scale-like pubescence, and interspersed with a few erect, black bristle-like hairs, these latter most prominent on vertex and anterior margin of pronotum. Head with eyes nearly as in Ilnacora, the tylus more prominent; vertex more distinctly flattened, the basal carina transverse and sharply defined; rostrum reaching upon intermediate coxae. Antennae much as in Ilnacora although segment I

is distinctly longer in three species here described. Pronotal disk much flattened, lateral margins nearly straight, or only slightly sulcate sinuate, anterior angles rounded, lateral margins sharply angled although not carinate. Legs rather long and slender, more so than in Ilnacora. Hemelytra very long in the male, the tip of the genital segment not reaching the base of cuneus; in the female the tip of venter reaching to near apex of cuneus. General form of the genitalia distinctive of the genus; the right clasper more suggestive of Ilnacora, while the left clasper appears different from any of the closely related genera (fig 1).

Genotype: *Ilnacorella nigrisquamosa* new species.

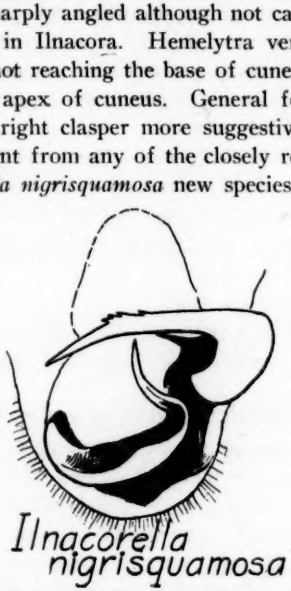

Fig. 1. *Ilnacorella nigrisquamosa* n. sp., male genital segment, posterior aspect showing genital claspers, right clasper raised somewhat above the normal position.

Ilnacorella nigrisquamosa new species.

Color dark green, antennae and venter black; dorsum clothed with evenly distributed black scale-like pubescence and interspersed with more erect, black bristle-like hairs: calli moderately convex, not distinctly sulcate along posterior margins.

♂. Length 5.4 mm., width 1.5 mm. Head: width .88 mm., vertex .47 mm.; green, vertex becoming blackish but median line green, base of tylus and narrowly surrounding antennal socket blackish; vertex and sides of front with erect, prominent black bristles, basal carina with about eight black bristles, spot on middle of carina and a larger one at each side of vertex next to the eye, glabrous. Rostrum, length 1.04 mm., reaching upon base of intermediate coxae, green, apex blackish. *Antennae*: segment I, length .86 mm.; II, 2.14 mm.; III, 1.43 mm.; IV, .58 mm.; dark fuscous to black, dorsal surface of segment I greenish; clothed with black pubescence but more sparsely set than in *Ilnacora malina* Uhler. *Pronotum*: length .67 mm., width at base 1.2 mm.; lateral margins nearly straight, sharply angled, the edges made more prominent by a slight sulcation bordering the margin; calli only moderately convex, but appearing slightly more elevated than anterior margin of disk, beset with three or four prominent black bristles on disk of each, separated by a slight depression but the posterior margins scarcely delimited from the nearly flat pronotal disk; disk beset with several prominent, black bristle-like hairs, but more thickly covered by the appressed, black scale-like pubescence which likewise covers the scutellum and hemelytra; color dark green, blackish between the calli. Scutellum more flattened than in *Ilnacora malina* Uhler,

green, mesoscutum fuscous at the sides and on middle. Sternum fuscous, pleura greenish, ostiolar peritreme fuscous. *Hemelytra*: elongate, the base of cuneus arising at a point slightly beyond tip of venter, embolar margins only very slightly arcuate; uniformly dark green in color; clothed with rather evenly distributed, appressed, black scale-like pubescence, and interspersed with a few erect, stiff black hairs; membrane fully developed, uniformly fuscous, areoles as in *Ilnacora*, veins pale to greenish. *Legs*: long and slender, hind femora extending slightly beyond tip of venter or to base of cuneus, uniformly clothed with rather short black hairs, the tibial spines scarcely more prominent than the black hairs and in length not exceeding thickness of tibia; green or yellowish green, tarsi, narrowly at base and apices of tibia, fuscous, apical half of femora obscurely dotted with minute fuscous points which are not located at base of hairs. Arolia erect, converging at apices as in Ilnacora, the pseudarolia likewise prominent. *Venter*: black, a greenish spot each side of genital segment; clothed with pale to dusky pubescence, the scale-like type not apparent; genital claspers distinctive (fig.).

Holotype: ♂ August 1, 1900, Lizzard Hill, Colorado (E. D. Ball); author's collection.

Ilnacorella sulcata new species.

Structurally very similar to *nigrisquamosa* except in form of the pronotum; also differs in the uniformly green color of head, venter, and legs; color yellowish green, the hemelytra blue green.

♂. Length 5.8 mm., width 1.8 mm. Head: width .90 mm., vertex .46 mm. Rostrum, length 1.11 mm., attaining hind margin of mesosternum, green, the apex black. Antennae: broken. *Pronotum*: length .73 mm., width at base 1.26 mm., lateral margins prominent, almost carinate, distinctly sulcate in outline; differs from *nigrisquamosa* in that the margins of the calli are strongly sulcate except outer anterior angles which are continuous with the rounded anterior angles of pronotal disk; anterior margin of pronotum distinctly arched, fully as high as disk of each callus, thus lending to the effect of the calli being set in a depression. Dorsum with black scale-like pubescence nearly as in *nigrisquamosa* but the bristle-like hairs on head and anterior margin of pronotum appear more prominent. Venter uniformly green; genital claspers nearly as in *nigrisquamosa*, the two species indicating that the claspers are chiefly generic in character.

♀. Length 5.8 mm., width 1.94 mm. *Head*: width .94 mm., vertex .51 mm. Rostrum, length 1.20 mm., fully attaining posterior margin of mesosternum. *Antennae*: segment I, length .81 mm., cylindrical; II, 2.26 mm., slender, cylindrical, thickness equal to half the diameter of segment I; II, 1.48 mm.; IV, .60 mm.; yellowish green, last two segments fuscous, narrow base of segment I black, base and apex of segment II narrowly fuscous; clothed with short, stiff, black pubescent hairs, more sparsely set than in Ilnacora, segment I with six or eight erect black bristles which in length about equal thickness of segment.

Holotype: ♂ July 4-11, 1923, Waterton Lakes, Alberta (J. McDunnough); No. 1344 in the Canadian National collection.

Allotype: taken with the type; author's collection.

Paratypes: ♂, 9♀, taken with the types; Canadian National collection and author's collection.

Ilnacorella argentata new species.

Form very similar to *sulcata*, but size smaller, differs from that species as well as *nigrisquamosa* by having the dorsum clothed with closely appressed, silvery white, scale-like pubescence, but intermixed with rather sparsely set, erect bristle-like black hairs; the bristle-like hairs on head and pronotum nearly as in *sulcata*. Color very similar to *sulcata* except vertex, frons, and tylus are distinctly yellow.

♀. Length 4.6 mm., width 1.6 mm. Head: width .93 mm., vertex .48 mm. Rostrum, length 1.08 mm., reaching to middle of intermediate coxae. Antennae: segment I, length .58 mm.; II, 1.71 mm.; III, 1.14 mm.; IV, missing. Pronotum: length .61 mm., width at base 1.08 mm. Membrane of hemelytra uniformly pale fuscous, veins green.

Holotype: ♀ June 23, 1924, Gallatin County, Montana (Wm. C. Cook); author's collection.

Paratypes: 3 ♀, taken with types; ♀ June 16, 1912, Florence, Montana; Montana Agricultural Experiment Station collection and author's collection.

Labopidea nigrisetosa new species.

Somewhat smaller than *simplex* Uhler, and differs in pubescence and color of legs. The black legs are suggestive of *nigripes* Reuter but that species is distinguished by the soft pale pubescence.

Black, vertex, pronotum except calli, and hemelytra olive green to dark green, scutellum greenish to black; clothed with nearly erect, stiff black setose hairs, the heavy black hairs more prominent on vertex and anterior half of pronotal disk. Hemelytra abbreviated, not extending beyond seventh abdominal segment in either sex; area of membrane not equal to that of cuneus.

♂. Length 3.1 mm., width 1.5 mm. Head: width 1.03 mm., vertex .61 mm. Antennae: segment I, length .37 mm.; II, 1.5 mm.; III, missing. Pronotum: length .60 mm., width at base 1.31 mm.

♀. Length 3.5 mm., width 2 mm. Head: width 1.03 mm., vertex .66 mm. Antennae: segment I, length .37 mm.; II, 1.4 mm.; III, missing. Pronotum: length .63 mm., width at base 1.26 mm.

Holotype: ♂ July 20-25, 1920, Yellowstone National Park, Wyoming (A. A. Nichol); author's collection.

Allotype: July 31, 1921, Nordegg, Alberta (J. McDunnough); No. 1349 in the Canadian National collection.

Paratypes: ♀ Aug. 15, 1921, Barkerville, B. C. (E. R. Buckell). ♀, Aug. 7, Yellowstone National Park, Wyoming (Heidemann collection).

Irbisia nigripes new species.

This species runs close to *setosa* V.D. and *solani* Heid. in Van Duzee's key to the species of *Irbisia* (Proc. Calif. Acad. Sci., (ser. 4), xi, 1921, p. 151), but is distinguished by the very prominent and nearly rectangular humeral angles, as well as the uniformly black legs and rostrum.

Pronotal disk more flattened than in *solani*, the lateral margins nearly straight and clothed with prominent erect, pale brownish hairs which extend on the disk but appear more conspicuous along lateral and anterior margins; disk more closely and confluently punctate than in *solani*. Dorsum clothed with white sericeous pubescence which becomes more or less brownish on scutellum and hem-

elytra, but intermixed on pronotum and head with prominent, erect, pale to brownish hairs. Embolar margins distinctly arcuate; membrane fully developed; apex of cuneus nearly attaining tip of venter. Uniformly black, pleura of pronotum pale below line of coxal cleft; polished as in *solani*; legs and rostrum without pale indications.

♂. Length 6.2 mm., width 2.7 mm. Head: width .83 mm., vertex .62 mm. Antennae: segment I, .67 mm.; II, 1.89 mm.; III, 1 mm.; IV, broken. Pronotum: length 1.14 mm., width at base 2 mm., width of anterior angles 1.14 mm.

♀. Length 6 mm., width 2.85 mm. Head: width 1.34 mm., vertex .71 mm. Antennae: segment I, length .63 mm.; II, 1.86 mm.; III, missing. Pronotum: length 1.2 mm., width at base 2.2 mm., width of anterior angles 1.21 mm.

Holotype: ♂ May 31, Troy, Idaho; Cornell University collection.

Allotype: topotypic; author's collection.

Paratypes: ALBERTA—2 ♀ June 19, ♂ June 24, 1923, Waterton Lakes (J. McDunnough). ♂ 3 ♀ June 20, ♂ ♀ June 30, ♂ July 10, 1923, Waterton (E. H. Strickland); No. 1346 in the Canadian National Collection. BRITISH COLUMBIA—♀, Vernon; Canadian National Collection. MONTANA—♀ June 30, 1911, Hinsdale; ♀ June 9, 1911, Thompson Falls; Montana Agr. Expt. Station collection.

Dichrooscytus barberi new species.

More robust than *suspectus* Reut., and differently colored; greenish yellow, apex of corium, tip of cuneus, small spot each side on margin before apex of scutellum, and veins of membrane, reddish to bright red.

♀. Length 4.4 mm., width 2.3 mm. Head: width 1.2 mm., length .48 mm, vertex .52 mm.; short, strongly vertical. Rostrum, length 2.03 mm., extending slightly beyond posterior margins of hind coxae. Antennae: segment I, length .38 mm.; II, 1.54 mm., slender, gradually thickened from middle toward apex; III, .78 mm.; IV, .31 mm. Pronotum: length .53 mm., width at base 1.91 mm.; finely, obsoletely punctate, basal margin slightly sinuate, being broadly sulcate at middle. Scutellum distinctly convex, tranversely rugulose. Hemelytra with embolar margins rather strongly arcuate; cuneus sharply deflected. Clothed with rather short, closely appressed, golden yellow pubescence, more prominent on scutellum and hemelytra. Coloration greenish yellow, more green between and around the calli, rather broadly transversely red across apex of corium, apex of cuneus bright red; scutellum with dark reddish mark each side on margin before apex. Membrane pale yellowish, veins bright red; anal area, within apex of areoles, and irregularly in transverse cloud just beyond areoles, pale fuscous to fuscous. Ventral surface yellowish to greenish, basal half of venter more greenish; legs strongly yellow, tibial spines yellowish to brown.

Holotype: ♀ July 29, 1905, Huachuca Mts., Arizona (H. G. Barber); author's collection.

Polymerus basivittis pallidulus new variety.

Suggestive of *unifasciatus* var. *lateralis* Hahn, but more nearly the size of *basalis* Reut., the pale areas frequently with a tinge of red in the hypodermis although the cuneus is never distinctly red as in *lateralis* Hahn.

♀. Length 4.7 mm., width 2.4 mm. Head: width 1.05 mm., vertex .54

mm.; black, vertex with triangular pale spot next to each eye. Rostrum, length 1.7 mm., reaching posterior margins of middle coxae, reddish, becoming blackish apically. Antennae: segment I, length .46 mm.; II, 1.65 mm., pale reddish, more or less blackish at base and apex; III, .74 mm.; IV, .67 mm. Pronotum: length 1.01 mm., width at base 1.91 mm.

Black, more broadly pale than the typical *basivittis* Reut., pronotal disk with basal margin and basal one-third of lateral margins, pale with a tinge of reddish in the hypodermis. Apex, or apical half of scutellum except lateral margins, basal one-third to one-half of corium and frequently extending along radial veins to connect with spot at apex of embolium and corium, embolar margins, tip of clavus and sometimes inner margins, cuneus entirely or with exception of fuscous cloud on central area, pale, usually with a tinge of reddish showing through cuticula from the hypodermis; anal ridge and veins of the membrane pale. Clothed with silvery sericeous pubescence, becoming golden on clavus and margins of scutellum, and to some extent on corium. Tibiae pale to reddish, or with blackish appearing on basal one-third, hind tibiae with white line on dorsal surface extending full length except for blackish at extreme tip; femora becoming pale reddish on anterior face, although a double row of blackish dots persists. Venter black but becoming more or less pale reddish on sides; clothed with pale pubescence and intermixed with some silvery sericeous pubescence, thus differing from *unifasciatus* Fab. which species is clothed with prominent golden sericeous pubescence.

♂. Length 5 mm., width 2.3 mm. Head: width 1.01 mm., vertex .53 mm. Antennae: segment I, length .45 mm.; II, 1.71 mm.; III, .68 mm.; IV, .71 mm. Pronotum: length .93 mm., width at base 1.74 mm. Pale areas of the dorsum nearly as extensive as in the female; venter rarely with pale on the sides.

Holotype: ♀ July 20-25, 1920, Yellowstone Park, Wyoming (A. A. Nichol); author's collection.

Allotype: same data as type.

Paratypes: 2 ♂ 3 ♀, taken with the types. ALBERTA—2 ♂ 3 ♀ July 22, 1923, Waterton Lakes (J. McDunnough); No. 1347 in the Canadian National collection. COLORADO—3 ♂ 4 ♀ Aug. 18-22, 1924, Pingree Park (Drake & Hottes). ♀ Aug. 1914, Greede, alt. 8844 ft., (H. B. Hungerford). 8 ♂ ♀, "Colo." (C. F. Baker), U. S. National Museum. 20 ♂ ♀, July 20, 1898, Little Beaver, west of Fort Collins, alt. 9500 ft. (E. D. Ball). MONTANA—2 ♂ 2 ♀ Aug. 1913, Beaver Creek, alt. 6300 ft. (H. B. Hungerford). WYOMING—♀ Aug. 3, ♀ Aug. 7, Yellowstone National Park. ♂ 3 ♀, July, 1883, "Ft. McKin." (U. S. N. M.).

Reuter's original description of *basivittis*, based on a female specimen, states that the second antennal segment is equal in length to basal width of pronotum. In the present described variety, antennal segment II is distinctly shorter than width of pronotum at base as indicated by the above measurements. The writer is inclined to believe that Reuter's statement is not based on measurement of the specimens and thus may err in that respect. The type of *basivittis* was collected on Pikes Peak, Colo., (alt. 9000 ft.) and apparently represents a dark variety of the species in which the pronotum is entirely black. A specimen is at hand from Colorado [♂ July 18, 1898, Little Beaver (E. D. Ball)] which fits the color

patterns of the typical *basivittis* except that the basal margin of the pronotum is slenderly pale. This near approach to the black form leads me to believe that the insect here described is probably only a color variety of *basivittis* Reut., yet represents the commonest color phase of the species. Variety *pallidulus* is distinguished by having basal margin of pronotum pale.

A NEW FUNGUS DISEASE OF THE SATIN MOTH LARVA.*

BY P. VUILLEMIN,
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L'étude du parasite qui cause la muscardine du *Stilpnotia salicis* dans les districts occidentaux du Canada, notamment la Colombie Britannique, fut confiée au Professeur Vuillemin de Nancy. Nous transcrivons le résultat de ses recherches.

Les larves et les pupes malades sont envahies par un champignon du genre *Spicaria*. Les caractères aperçus à l'examen direct se sont maintenus dans les cultures poursuivies durant dix mois, restant indéfiniment blanches ou à peine jaunâtres; ils justifient la création d'une espèce nouvelle, *Spicaria canadensis* Vuillemin.

M. Dombray, préparateur, a multiplié sans difficulté les cultures pures sur gélose sucrée, plus simplement sur carotte stérilisée et sur d'autres milieux végétaux, tels que les feuilles coupées de murier.

Les cultures offrent une égale vigueur à la température ambiante, à la glacière ou le thermomètre oscille entre + 3 et + 5° C, à l'étuve réglée à 30° ou 37°; elles ne poussent pas à 45°.

Les rameaux ultimes du sporophore qui portent les conidies sont des phialides, sans rapport avec la reproduction sexuelle, à l'inverse des basides, qu'elles rappellent superficiellement par leur forme de flacon ventru, étiré en col analogue à un stérigmate.

Les conidies se succèdent en progression basipète. Toutefois les chapelets sont fragiles; dans les préparations, une seule spore ronde, très jeune, n'atteignant pas 2μ, adhère au col de la phialide; on ne peut apprécier la forme et les dimensions définitives que sur les plus grandes des conidies éparpillées.

Le *Spicaria canadensis* est voisin d'espèces qui causent en France la muscardine des Coléoptères. *Le Spicaria Aphodii* Vuillemin s'en distingue par ses cultures roses et par ses conidies beaucoup plus petites. Le *Spicaria verticilloides* F. Vincens, ennemi naturel des *Cochylis* et des *Eudemis*, transmissible expérimentalement au *Bombyx mori*, a des cultures incolores; par les dimensions des phialides et des conidies, il est intermédiaire entre le *Spicaria aphodii* et le *Spicaria canadensis*.

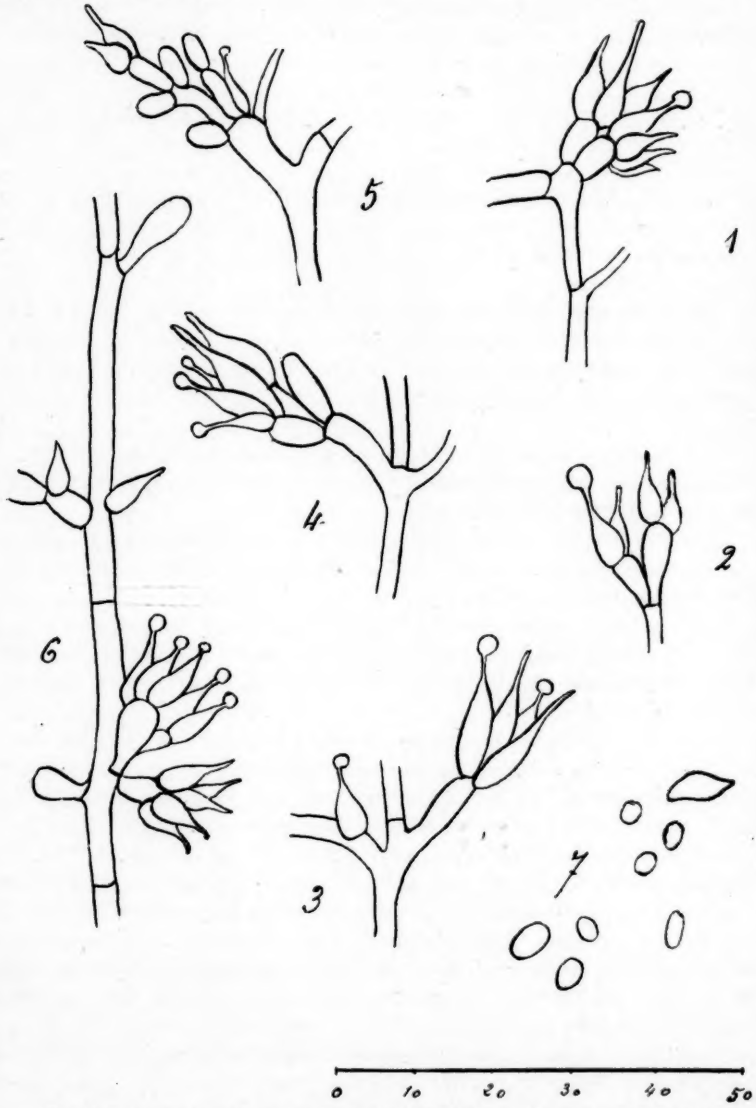
Les caractères de l'espèce sont résumés dans la diagnose suivante, rédigé en latin selon la règle.

Spicaria canadensis Vuillemin, sp. nov.

Mycelio tenuissimo, repente, septato, albo vel luteolo; hyphis fertilibus ramosis; ramis alternis, ultimis brevibus; phialidibus (basidiis auctorum) saepius

*—The above paper is submitted at the request of the Dominion Entomologist as it should be of interest to economic entomologists generally. The material was collected and studied preliminarily by Mr. R. Glendenning, in charge of the Dominion Entomological Laboratory at Agassiz, B. C.

apice glomeratis, piriformibus, 8-17 x 3μ; conidis laxe catenulatis, hyalinis, oblongis, 4-5, 4 x 2-8-3μ.



Habitat in larvis et pupis *Stilpnotiae salicis* in Canada occidentale. Legit clar. Arthur Gibson.

Une pupe de *Stilpnotia* conservée dans l'alcool acétique avait le tégument parsemé de taches brunes.

Dans diverses maladies parasitaires des larves d'insectes, l'altération générale rétentit sur la vitalité du tégument. Sans être atteinte par les parasites,

la surface est mouchetée de taches sombres, comme si elle était saupoudrée de poivre; cette lésion cutanée est un épiphénomène connu sous nom de pébrine.

Cet accident est commun dans la maladie corpusculaire du ver à soie, que l'on continue à appeler la pébrine, bien que le *Nosana bombycis* son agent, n'existe pas dans les taches et qu'on retrouve des taches semblables dans des mycoses.

L'abbé de Sauvage diagnostiquait la muscardine aux points noirs répandus sur différents endroits de la peau. Pasteur crut que cet auteur confondait la muscardine avec la pébrine. Il n'existe probablement entre diverses maladies des insectes qu'une différence dans le dégré de fréquence des taches, qui ne constituent en tout cas qu'un accident secondaire. L'opinion de l'abbé de Sauvage trouve une confirmation indirecte dans de récentes observations.

M. F. Vincens (1912) inocule au ver à soie des *Spicaria*, et des *Verticillium* provenant de larves et de pupes de *Cochylis* et d'*Eudemis* atteintes de muscardine. La mycose expérimentale est fréquemment accompagnée d'une éruption de pébrine. Que l'agent pathogène soit un Protozoaire ou un Champignon, il ne pénètre pas dans les taches.

Le *Spicaria canadensis* qui remplissait la pupe de *Stilpnotia salicis* n'atteignait pas davantage les taches superficielles. Ce cas se distingue des précédents en ce que la coloration du tégument est déterminée par un champignon différent du Spicaria. Au niveau des taches, les poils renferment des filaments bruns, tortueux, ramifiés, munis de cloisons rapprochées.

EXPLICATION DES FIGURES.

Appareil conidien du *Spicaria canadensis* Vuillemin.

1. Mycélium cloisonné portant deux sporophores unicellulaires terminés par un verticille de phialides en forme de flacon ventru à col effilé. Un col porte une jeune conidie. 2. Sporophore allongé. 3. A droite, phialides portées sur un sporophore continu avec le mycélium. A gauche, phialide portée directement par le mycélium. 4, 5. Sporophores allongés, cloisonnés et ramifiés. 6. Sur le segment inférieur du mycélium, sporophores typiques; sur le suivant à droite, phialide portée directement sur le mycélium; à gauche, sporophore cloisonné. 7. Conidies eparpillées. Echelle de 50 millièmes de millimètre.

STUDIES IN NORTH AMERICAN BORBORIDAE (DIPTERA)*.

BY ANTHONY SPULER,
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The six subgenera discussed in this paper include some of the most interesting species of the entire family. All of them with the exception of *Coprophila* have the characters common to the group Scotophilae, yet they present such striking characters that it is not difficult to separate them into subgenera. Dr. Oswald Duda in his revision of the European species of *Limosina* divides the group *Scotophilae* into several subgenera including *Thoracochaeta*, *Trachyopella* and *Halidayina* discussed in this paper. Two species examined by the writer had very small eyes common to *Trachyopella* but the eyes are bare and the wing venation and structure of front are entirely different to that found in *Trachyopella*.

*—Contribution from the Division of Entomology of the Washington Agricultural Experiment Station, State College of Washington.

The new subgenus *Spelobia* has been established for these species. Several species from the tropics have pictured wings and a peculiar wing venation different to those of other species in this group. For these species the writer has erected the subgenus *Pterogramma*.

Coprophila is the only known subgenus in the group *Coprophilae*. The species of this subgenus are easily recognized by the uniformly setulose scutellum.

This is one of a series of papers on the Borboridae.

Unless otherwise designated, the type specimens are placed in the A. L. Melander collection.

GROUPS OF SCOTOPHILAE AND COPROPHILAE

Apical bristles present, preapical bristles absent; scutellum with four marginal bristles, rarely with six; disc bare ..... *Scotophilae*
Apical and preapical bristles absent; middle metatarsi with a row of stiff setae beneath; scutellum uniformly setulose ..... *Coprophilae*

SCOTOPHILAE

1. Wings usually distinctly pictured; crossveins equal or nearly so ..... *Pterogramma* n. subgen.
   Wings never distinctly pictured 2
2. Eyes small, finely hairy; last section of third vein distinctly curved up..... *Trachyopella* Duda
   Eyes bare 3
3. Costa with a single long and strong, upwardly and inwardly curved bristle at base ..... *Halidayina* Duda
   Costa without such bristle 4
4. Eyes extremely small; antennae divergent but not opposed; face concave; dorsocentral bristles in two pairs ..... *Spelobia* n. subgen.
   Eyes larger; antennae opposed; face tuberculate or carinate 5
5. Eyes small; costa extending much beyond third vein .... *Elachiosoma* Rond.
   Eyes large 6
6. Wings with veins concentrated toward base; third vein abruptly bent up on last section; costa short ..... *Bromeloecia* n. subgen.
7. Wings with veins not concentrated toward base; costa extending to near wing-tip; dorsocentral bristles stiff, in four pairs ..... *Thoracochaeta* Duda.

COPROPHILAE

A single subgenus ..... *Coprophila* Duda.

Subgenus **Pterogramma** n. subgen.

Wings usually distinctly pictured; costa extending to near wing tip and ending at third vein or but very little beyond, second section usually not more than one-third as long as third; crossveins rather close together, outer and inner crossveins equal or nearly so; third vein only slightly curved up on last section. Antennae widely divergent; eyes large; face more or less tuberculate between antennae, excavated below tubercle and produced at mouth margin; front more or less flattened; interfrontal bristles weak. Apical bristle weak, often absent in male. Type species. *P. sublugubrina* Mall.

SPECIES OF PTEROGRAMMA

1. Notum with distinct grayish white vittae 2
   Notum without such markings 4

2. Dorsocentral bristles in one pair; apex of wing clear; front, face, antennae and legs yellow; costa ending beyond third vein; abdomen glossy black..... ..... *vittata* Mall.
Dorsocentral bristles in two pairs 3
3. Anterior pair of dorsocentral bristles long and strong; apex of wings infuscated; face and cheeks yellowish brown; antennae and legs for the most part yellow; halteres brown, stalks yellow .....*poeciloptera* Mall.
Anterior pair of dorsocentral bristles weak; apex of wings clear; head yellow, front brown; arista bare; hind metatarsi half as long as second joint..... ..... *monticola* Mall.
4. Second section of costa very short, less than one-fourth as long as third; last section of second vein ending much before inner crossvein; wings with the exception of a few hyaline spots, entirely browned; front and face yellow; legs for the most part yellow. Fig. 9 .....*luxor* n. sp.
Second section of costa at least one-third as long as third 5
5. Wings with definite bands of dark brown infuscations 6
Wings not so marked but with an indistinct fascia beyond end of third vein 9
6. Last section of third vein distinctly curved up 7
Last section of third vein straight; legs entirely yellow; front and vertex shining black, lower front yellowish; face yellow; mesonotum with a single pair of dorsocentral bristles; halteres with stem yellow and knob brownish black; wing markings somewhat indistinct ..... *orthoneura* n. sp.
7. Mesonotum black 8
Mesonotum yellow, browned posteriorly; legs yellow with bases of femora browned; last section of second vein longer than basal section of third; second vein ending beyond inner crossvein ..... *meridionalis* Mall.
8. Second vein ending beyond inner crossvein; legs for the most part yellow; halteres fuscous; dorsocentral bristles in two pairs ..... *intrudens* Mall.
Second vein ending before inner crossvein; front shining black, lower portion yellow; interfrontal bristles very weak; legs for the most part black; halteres black; dorsocentral bristles in one pair. (Fig. 8) ..... *madaris* n. sp.
9. Second section of costa one third as long as third; outer crossvein but little longer than inner; front opaque, reddish or brownish yellow; legs, face and cheeks yellow ..... *sublugubrina* Mall.
Second section of costa three-eights as long as third; outer crossvein distinctly longer than inner; front tawny yellow; hind metatarsi a little more than half as long as next joint ..... *lugubrina* Mall.

Leptocera (*Pterogramma*) *vittata* Malloch.

Malloch: Tran. Am. Ent. Soc. 40. 12 (1914). Costa Rica.

Leptocera (*Pterogramma*) *poeciloptera* Malloch.

Malloch: Tran. Am. Ent. Soc. 40. 11 (1914). Costa Rica.

Leptocera (*Pterogramma*) *monticola* Malloch.

Malloch: Trans. Am. Ent. Soc. 40. 14 (1914). Costa Rica.

Leptocera (Pterogramma) luxor n. sp. (Fig. 9).

Shining to glossy black. Front yellow to reddish, flat; interfrontal bristles reduced; ocellar tubercle brownish; face brown to black, produced, broadly carinate, tuberculate between antennae, slightly concave in profile; mouth margin

distinctly produced; clypeus broadly visible from in front; eyes oblique, almost two times as long as broad; antennae reddish, third joint elongate; arista a little more than two times antennal length, short pubescent; cheeks yellow, one-fourth as high as long diameter of eye when measured at vibrissal angle. Mesonotum broad, slightly convex; dorsocentral bristles in two pairs; acrostichal hairs sparse, the middle row longer than the others; scutellum with four strong marginal bristles. Legs dusky yellow with the basal half of hind femora and the apical half of all tibiae black; middle femora with a stiff, short bristle on anterior surface near apex; middle tibiae with strong extensor bristles; apical bristles absent; apex with a number of short stiff setae; hind tibiae with rows of hair-like bristles on extensor surface; hind tarsi incrassate; hind metatarsi two-thirds as long as second joint. Abdomen broad, sparsely hairy; segments equal or nearly so. Halteres with stem yellow and knob black. Wings as in Fig. 9 Length: 2 mm.

Type.—Female; La Suiza de Turrialba Costa Rica (Pabla Schild).

Paratypes.—Six specimens from same collection.

Leptocera (Pterogramma) orthoneura n. sp.

Subshining black. Front and vertex shining black, lower front yellowish; interfrontal bristles greatly reduced, but distinct, in three pairs; face yellow, carinate to near mouth margin, epistome curved up; antennae yellow to brown but little divergent, third joint small, arista slightly more than three times antennal length; eyes large, distinctly convex; cheeks one-fifth as high as eye at vibrissal angle, yellow anteriorly changing to black posteriorly. Mesonotum and scutellum subshining black; mesonotum with a single pair of dorsocentral bristles; acrostichal setulae weak, in six rows between the dorsocentral bristles; scutellum with four marginal bristles. Legs clear yellow with bristles very much reduced; front femora with two short, stiff setae above, one at basal third, one at apical third and five long hair-like bristles beneath; middle tibiae with apical bristle absent in male, present in female, hind metatarsi two-thirds as long as the next joint. Second segment of abdomen as long as the next two; hypopygium large. Halteres with stem yellow and knob brownish black. Wings similar to *madaris* Spuler but with the spotting less distinct and with the last section of third vein straight. Length: 1.5 mm.

Type.—Male; La Suiza de Turrialba Costa Rica, (Schild).

Paratypes.—Five specimens from same locality. (Schild).

Leptocera (Pterogramma) meridionalis Malloch.

Malloch: Tran. Am. Ent. Soc. 40. 13 (1914). Costa Rica.

Leptocera (Pterogramma) intrudens Malloch.

Malloch: Brooklyn Ent. Soc. Bull. XVII. 3 (1922).

This species is described from Beltsville, Md.

Leptocera (Pterogramma) madaris n. sp. (Fig. 8).

Opaque black. Front broader than high, with a distinct M-shaped, silvery pollinose mark extending over the orbital stripes over to the ocellar triangle, then down on each side of the ocellar triangle to near the lower margin of front; interfrontal stripes and ocellar tubercle velvety black, ocelli white; orbital stripes and lower front, yellowish; interfrontal bristles minute, almost absent; face yellow with black markings on either side of the slight tubercle between anten-

nae, lower margin blackish; cheeks blackish, one-fourth as high as diameter of eye; antennae divergent, brownish; arista two and one-half times antennal length, short pubescent. Mesonotum pruinose; dorsocentral bristles in one pair; acrostichal setulae sparse, arranged in four rows between the dorsocentral bristles; scutellum pruinescent, triangular; marginal bristles four. Legs black with apices and bases of front and middle femora, front, middle and hind tarsi and front tibiae yellow and with the middle and hind tibiae with the usual extensor bristles and a distinct apical bristle; hind metatarsi one-half as long as second joint. Abdomen shining black, all segments nearly equal. Halteres black. Wings as in Fig. 8. Length, 1.5 mm.

Holotype.—Female; La Suiza de Turrialba Costa Rica, (Schild).

Leptocera (*Pterogramma*) *sublugubrina* Malloch.

Malloch: Smiths. Misc. Coll. 59 No. 17, pub. 2133. 8 (*Limosina*).
lugubris Williston: Tran. Ent. Soc. 433 (1896). (*Limosina*).

Two specimens, from Plummers Isl., Maryland (Schwarz) and Utuado, Porto Rico. (Busck). [U. S. N. M.].

Leptocera (*Pterogramma*) *lugubrina* Malloch.

Malloch: Proc. U. S. N. M. 44. 369 (1913). (*Limosina*) Porto Rico.

Subgenus **Trachyopella** Duda.

Duda: Abhand. Zool-Botan. Ges. Wien. X. I. 34 (1918).

Eyes hairy, extremely small; cheeks about as high as the long diameter of eye; front broad; central stripe shining, lateral stripes opaque, margined with a row of hairs; interfrontal bristles hair-like; antennae directed outward; ocellar tubercle distinct, ocelli distinct; face produced between antennae. Mesonotum with only the prescutellar pair of dorsocentral bristles present. Costa extending to near wing-tip, produced much beyond third vein; outer and inner crossveins close together; last section of third vein strongly curved up. Apical bristle present. Type species. *T. melania* Hal. by present designation.

Leptocera (Trachyopella) lineafrons n. sp. (Fig. 10).

Opaque black. Front very broad; the center stripe, extending laterally to a little beyond the interfrontal row of bristles, shining black, the lateral margins with a row of hairs; the narrow stripes on either side, opaque; frontoorbital bristles reduced to setulae; orbital setulae minute; ocellar tubercle present; ocelli not widely separated; interfrontal bristles hair-like, rather long, in four to five pairs; face produced between the antennae, carinate, slightly concave in profile; anterior margin of eqistome abruptly curved up; clypeus narrowly visible from in front; antennae directed outward; second joint larger than third, with short apical bristles; third joint with whitish pubescence; arista thin, three times antennal length, with very long pubescence; eyes finely hairy, small, occupying less than one-half the height of head from oral margin to vertex; cheeks about the height of eye; buccal and oral setulae microscopic. Mesonotum with a single pair of dorsocentral bristles; acrostichal setulae numerous, in six irregular rows between the dorsocentral bristles; scutellum triangular, marginal bristles four. Legs dark fuscous to piceous, with the usual bristles; hind tarsi with the first and second joints thickened, the first two-thirds as long as second. Wings hyaline, slightly browned along last section of third vein; costa extending to near wing-tip; first section with a basal bristle, slightly longer than second; second a little more than one-half as long as third; outer

crossvein its own length from inner; basal section of third vein one-half as long as last section of second vein and a little longer than the distance between crossveins; last section of third vein distinctly curved up and ending much before wing-tip; fourth vein not traceable to near wing-margin. Abdomen short, cylindrical. Length: 0.5 mm.

Type.—Male. Wash. Exp. Sta. No. 74 (Doane).

Paratypes.—Three specimens from the same collection.

Subgenus **Halidayina** Duda.

Costa with a single, very long and strong, upwardly and inwardly curved bristle; last section of third vein distinctly curved up at middle and ending considerably before wing-tip; costa extending much beyond third vein. Eyes normal; interfrontal bristles well developed; face concave when viewed in profile; antennae divergent but not opposed; Apical bristle and middle metatarsal bristle absent. Type species.—*H. spinipennis* Hal.

(To be Continued)

SOME SYNONYMY IN THE ICHNEUMONIDAE.*

BY H. L. VIERECK,
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Ameloctonus fugitivus Say.

Banchus fugitivus Say, Boston, Jour. Nat. Hist. I (247), 1835; (Leconte ed.) 2 (701), 1859.

Cushman and Gahan, Proc. Ent. Soc. Washington, 23 (159) 1921, have relegated this species to Foerster's genus *Hyposoter,* presumably on the theory that by "abruptly clavate" Say meant gradually clavate and have included (*Limneria*) *Horogenes guignardi* Prov. and (*Limneria*) *Hyposoter oedemisiae* Ashm. as synonyms. Now the last two species spin their cocoon inside the larval skin of their host and I hold that no such species can correctly by synonymized with Say's species since he expressly says that his insect was reared from a cylindric white cocoon maculated with two black bands. (*Mesopleptus*) *Ameloctonus annulipes* Cresson has a cocoon such as Say describes but can be separated from Say's species by the hind tibiae which are black near the base but not at the base as said by Say to be the case in his species.

Ameloctonus fugltivus Viereck (not Say), Hym. Conn. Geol. & Nat. Hist. Survey, Vol. 22 (267), 1917 equals *Horogenes guignardi* Provancher.

Apropos of the above segregates of *Campoplex* Gravenhorst, I am of the opinion that *Ameloctonus* Foerster, *Horogenes* Foerster and *Hyposoter* Foerster are at most subgenera of *Campoplex* Gravenhorst as restricted to replace *Omorgus* Foerster. Gahan 1914 has synonymized *Ameloctonus* Foerster, *Anilastus* Foerster, *Hypothereutes* Foerster and *Ischnoscopus* Foerster with *Hyposoter* Foerster. But if we are to accept Gahan's synonymy I hold that we must go back to *Horogenes* Foerster and regard the above synonyms of *Hyposoter* Foerster, as well as the latter genus, as synonyms of *Horogenes* Foerster, this being in turn a subgenus of *Campoplex* Gravenhorst.

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